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TINGKAT 27, 30 DAN 32,
MENARA DAYABUMI,
JALAN SULTAN HISHAMUDDIN,
50623 KUALA LUMPUR

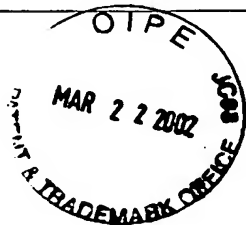
Ministry of Domestic Trade and Consumer Affairs Malaysia,
Intellectual Property Division

Telefon: 03-22742100
Fax: 03-22741332

10027814

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6-13-02



Fail Tuan:

Fail Kita:

Tarikh:

To:

Dato' V.L Kandan / Wong Sai Fong

Shearn Delamore & Co.

No. 2 Benteng

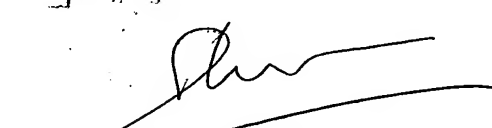
50050 Kuala Lumpur.

MALAYSIA

PATENT APPLICATION NO: PI 2000 6077

This is to certify that annexed hereto is a true copy from the records of the Registry of Trade Marks and Patents, Malaysia of the application as originally filed which is identified therein.

By authority of the
REGISTRAR OF PATENTS


ABDUL RAHMAN RAMLI
(CERTIFYING OFFICER)
21 February 2002



KEMENTERIAN PERDAGANGAN DALAM NEGERI
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CERTIFICATE OF FILING

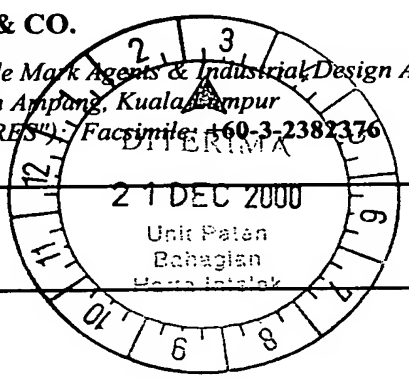
APPLICANT : PETROLIAM NASIONAL BERHAD
APPLICATION NO : PI 20006077
REQUEST RECEIVED ON : 21/12/2000
FILING DATE : 21/12/2000
AGENT'S/APPLICANT'S FILE REF. : SD/PAT/2315778/PKK/VS

Please find attached, a copy of the Request Form relating to the above application, with the filing date and application number marked thereon in accordance with Regulation 25(1).

Date : 11/01/2001


.....
(HASNON BT. ALANG MOHD RASHID)
for Registrar of Patents

To : WONG SAI FONG
M/s SHEARN DELAMORE & CO,
7TH FLOOR, WISMA HAMZAH-KWONG HING,
NO. 1, LEBOH AMPANG,
50100 KUALA LUMPUR
MALAYSIA

Patents Form 1 PATENTS ACT 1983 REQUEST FOR GRANT OF PATENT [Regulation 7(1)] To: The Registrar of Patents Patent Registration Office Kuala Lumpur, Malaysia	<p align="center">FOR OFFICIAL USE</p> Application No. <u>2000 6077</u> Filing date: <u>21-12-00</u> Request received on: <u>21-12-00</u> Fee received on: <u>21-12-00</u> Amount: <u>800.00</u> Cheque No. <u>SEA 515480</u>
<i>Please submit this Form in duplicate</i>	Date of mailing: December 21, 2000 Agent's file reference: SD/PAT/2315778/PKK/VS
THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE FOLLOWING PARTICULARS.	
<p>I. TITLE OF INVENTION OIL PAN FOR AUTOMOBILE ENGINE.</p> <p>II. APPLICANT(S) <i>(The data concerning each applicant must appear in this box or, if the space is insufficient, in the space below)</i></p> <p>Name : PETROLIAM NASIONAL BERHAD.</p> <p>I.C./Passport no. :</p> <p>Address : Tower 1, Petronas Twin Towers, Kuala Lumpur City Centre, 50088, Kuala Lumpur, Malaysia.</p> <p>Nationality : A corporation organised and existing under the laws of Malaysia.</p> <p>*Permanent residence or principal place of business : - same as above -</p> <p>Address for service in Malaysia : SHEARN DELAMORE & CO. <i>Advocates & Solicitors, Notary Public, Registered Patent Agents, Trade Mark Agents & Industrial Design Agents</i> <i>7th Floor, Wisma Hamzah-Kwong Hing, No.1, Leboh Ampang, Kuala Lumpur</i> <i>Telephone: 03-2300644; Telex: MA 30379 (answerback "JURESS"); Facsimile: +60-3-2382376</i></p>	
Additional Information	

*Delete whichever does not apply

20006077

II. INVENTOR(S)

The Applicant(s) is/are the inventor(s):

Yes ☐

No ☒

If no, the Applicant(s) hereby designate(s) the following as inventor(s)

NAME

ADDRESS

1. AZMI B OSMAN

YED CO. LTD.

3622-8 Nishikaizuka,

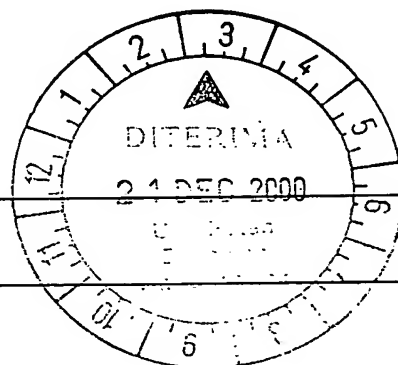
Iwata, Shizuoka 438-0026,

JAPAN.

(The inventor is a citizen of Malaysia.)

Additional inventors indicated on supplementary sheet ☐

Additional information



20006077

IV. AGENT OR REPRESENTATIVE

The Applicant(s) has/have appointed a patent agent in the accompanying Form 17

Yes ☒
No ☐

Patent Agent's Registration number: PA 86/0003

Applicants have appointed to be their common representative.

V. DIVISIONAL APPLICATION

This application is a divisional application: ☐

The benefit of the filing date ☐ and priority date ☐ of the initial application is claimed inasmuch as the subject matter of the present application is contained in the initial application identified below:

Initial application number:

Date of filing of initial application:

VI. DISCLOSURES TO BE DISREGARDED FOR PRIOR ART PURPOSES

(a) Disclosure was due to acts for the applicant or his predecessor-in-title ☐
Date of disclosure:

(b) Disclosure was due to the abuse of rights of applicant or his predecessor-in-title ☐
Date of disclosure:

A statement specifying in more detail the facts concerning the disclosure Yes ☐

Accompanies this Form No ☐

Additional information (if any)

VII. PRIORITY CLAIM (if any)

The priority of earlier applicant(s) is/are claimed as follows:-

Country*

Application no.

Filing date (dd/mm/yy)

-

-

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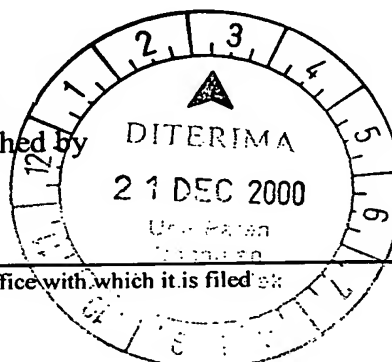
Symbol of the International Patent Classification:

If not yet allocated, please tick

The priority of more than one earlier application is claimed:

The certified copy of the earlier application(s) will be furnished by the patent agent upon request

☐
☐
☐



*if the earlier application is a regional or international application, indicate the office with which it is filed at

20006077

Additional information (if any)

VII. CHECK LIST

A. This application contains the following:

1.	Request (Form 1)	04	sheets
2.	description	06	sheets
3.	claim(s)	03	sheets
4.	abstract	01	sheets
5.	drawings (if any)	02	sheets

TOTAL

16

B. This Form, as filed, is accompanied by the items checked below:

- a. signed Form No. 17 ☒
- b. declaration that inventor does not wish to be named in the patent ☐
- c. statement justifying applicant's right to the patent ☒
- d. statement that certain disclosure be disregarded ☐
- e. priority document (certified copy of earlier application) ☐
- f. cheque, cash, etc. for the payment of application fee ☒
- g. other documents (specify) ☐

IX. SIGNATURE



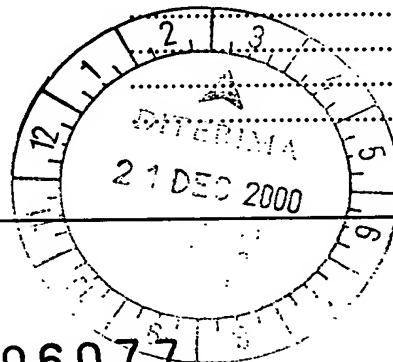
.....
Name: WONG SAI FONG
Regn : PA 86/0003

DECEMBER 21, 2000

.....
Date

For official use:

- 1. Date application received:
- 2. Date of receipt of
correction,
later filed papers, or
drawings
completing the application.



20006077

**STATEMENT JUSTIFYING
APPLICANT'S RIGHT TO THE INVENTION**

- I. Application Number :
- II. Agents file reference : **SD/PAT/2315778/PKK/VS**
- III. Applicant : **PETROLIAM NASIONAL BERHAD.**
- IV. Title of invention : **OIL PAN FOR AUTOMOBILE ENGINE.**
- V. Pursuant to Regulation 10(2) of the Patents Regulation 1986 I believe that the inventor(s) of the above-stated application is/are as follows: -

NAME

1. AZMI B OSMAN

ADDRESS

**YED CO. LTD.
3622-8 Nishikaizuka,
Iwata, Shizuoka 438-0026,
JAPAN.**

- VI. **STATEMENT JUSTIFYING THE APPLICANT'S RIGHT TO THE INVENTION in accordance with Regulation 10(2) of the Patents Regulations 1986:**
The applicant's right to the invention is by virtue of contract of employment with the inventor.

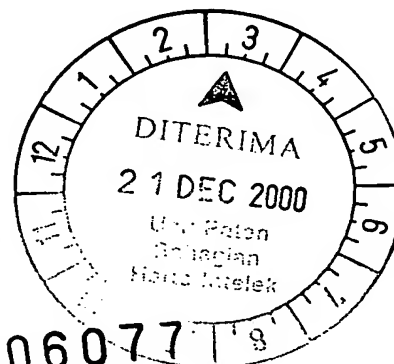
- VII. Signature



Name: WONG SAI FONG
Regn : PA 86/0003

DECEMBER 21, 2000

Date



Patents Form No. 17 PATENTS ACT 1983 APPOINTMENT OF PATENT AGENT [Regulation 48(2) and 45(3)] To: The Registrar of Patents Patent Registration Office Kuala Lumpur	<u>For official use</u> Application no.: Filing date: Received on:
Please submit one copy of this Form	Date of mailing: DECEMBER 21, 2000 Agent's file reference: SD/PAT/2315778/PKK/VS

*I/We, the undersigned,

Name : **Petroliam Nasional Berhad.**

Address: **Tower 1, Petronas Twin Towers,**
 : Kuala Lumpur City Centre,
 : 50888 Kuala Lumpur, Malaysia

appoint :
 Dato V.L. Kandan (PA 86/0004) and/or Wong Sai Fong (PA 86/0003) of
 SHEARN DELAMORE & CO.

Advocates & Solicitors, Notary Public, Registered Patent Agents, Trademark Agents

7th Floor, Wisma Hamzah-Kwong Hing, No.1 Leboh Ampang, 50100 Kuala Lumpur, Malaysia
 Telephone: 03-2300644 (general); facsimile +60-3-2382376; 2385625

To act as *my/our agent in connection with the following matters(s):

Oil Pan For Automobile Engine

Ratify all acts done by the agent on *my/our behalf in connection with *this/these matters(s), and request that all notices, requisitions and communications relating thereto be sent to the agent at the said address.

Any previous appointment in respect of the same matter(s) is revoked.

SIGNATURE:.....

Name **MOHD AZHAR BIN OSMAN KHAIRUDDIN**
 SENIOR GENERAL MANAGER
 Designation **LEGAL & CORPORATE AFFAIRS DIVISION**
 PETRONAS

* Delete whichever does not apply

** Specify other reason

20006077

OIL PAN FOR AUTOMOBILE ENGINE

Field of the invention

This invention relates to an oil pan for an automobile engine and refers particularly, though not exclusively, to such an oil pan having increased strength.

5 Background to the invention

Oil pans are secured to the lower end of engine blocks of automobile engines, be they internal combustion (petrol) engines, or diesel engines. All engine oil settles in the pan when the engine is not running. Some of the oil is in the oil pan when the engine is running, the remainder being circulated to various components of the engine for lubrication of those components.

10 Although the oil pan is bolted to the lower end of the engine block, the oil pan plays a part in the inherent structural strength of the engine and powertrains, particularly in relation to powertrain bending resistance.

15 To manufacture an oil pan, three dies are normally used. The third die is at the transmission-end of the oil pan and is used to create large pockets in the material of the oil pan at the transmission end. The large pockets are required for access by the third die. The third die is required for the creation of the necessary components to enable the transmission to be attached, and for the creation of arcuate reinforcement structures.

To increase the structural strength of the oil pan, as well as increasing resistance to noise, vibration and harshness ("NVH"), requires use of non-flat surfaces. With the use of the third die, that is difficult to achieve.

It is therefore an object of the present invention to provide an oil pan for an engine, and which has increased structural strength.

A further object is to provide an oil pan for an engine that has improved resistance to noise, vibration and harshness.

Another object is to provide an oil pan for an engine which can be manufactured without the use of a third die.

Summary of the invention

With the above and other objects in mind the present invention provides an oil pan for an engine, the oil pan having a plurality of substantially parallel, spaced-apart reinforcement channels extending from adjacent a first end of the oil pan to adjacent a second end of the oil pan, each channel having a base and two sides and an open top; the channels tapering downwardly from the first end and the second end towards an accumulation area of the oil pan.

The reinforcement channels may be substantially U-shaped, or V-shaped. The angle of taper may be due to the channels being curved with a large radius of curvature such as 2000mm.

The second end of the oil pan has an end surface that may be planar, and preferably has no tool access pockets therein.

Adjacent the second end and intermediate the width of the second end, the oil pan may have a region of reduced height. The region of reduced height preferably has a planar portion into which the at least one reinforcing channel does not extend as the planar portion is to releasably receive thereon a horizontal portion of a substantially L-shaped cover plate. Similarly, the channels may not be in the accumulation area. The cover plate has a substantially upright portion such that when the cover plate is mounted on the planar portion, the substantially upright portion is substantially coplanar with the end surface. Preferably, the substantially upright portion has a securing flange at an end thereof remote from the horizontal portion.

Description of drawings

In order that the invention may be readily understood and put into practical effect, there shall now be described by way of non-limitative example only a preferred construction of an oil pan incorporating the principal features of the present invention, the description being with reference to the accompanying illustrative drawings in which:

Figure 1 is a perspective view of the oil pan from beneath and one end;

Figure 2 is an underneath view of the oil pan;

Figure 3 is a side view of the oil pan;

Figure 4 is an end view of the oil pan from the direction of arrow 4 on

Figures 2 and 3; and

Figure 5 is a vertical cross-section along the lines and in the direction of arrows 5-5 of Figure 2.

Description of preferred embodiment

5 The oil pan illustrated is for an engine such as an internal combustion engine. It has a first end 10, a second end 12, and a peripheral, securing flange 14. However, the flange 14 is non-continuous at second end 12.

There is a main body 6 having side walls 18, a first end wall 20, base 22 and an accumulation area 24 into which oil will tend to chain. A second end wall 26 is provided and which tapers into a region 28 of reduced height. 10 Region 28 has a floor 30 which, adjacent second end 12 and intermediate the length of second end 12, has a generally flat area 44.

Flange 14 has a plurality of bolt holes 32 therethrough. To enable reasonable access to those bolt holes 32, side walls 18 and first end wall 20 have concave recesses 34. Additional bolt holes 36 are provided to secure 15 the oil pan in position, with bolt holes 38 being used to attach the oil pan to a transmission casing, and bolt holes 40 being for bolts 42 which are used to secure in place the horizontal portion 46 of an L-shaped cover plate 48. Cover plate 48 also has an upright portion 50 generally perpendicular to horizontal portion 46 and which, in turn, has an end flange 52 with bolt 20 holes 54. Upright portion does not have bolt holes, but horizontal portion does have bolt holes.

Second end 12 has an end surface 56 which is generally planar. Perpendicular portion 50 is generally coplanar with end surface 56. Surface 56 has no openings therein as a third die is not required, and there is no major volume of material behind surface 56 requiring large pockets or openings to reduce weight, as in the past. Therefore, surface 56 can be more easily machined.

Extending longitudinally of the oil pan are a plurality, preferably three, reinforcing channels 58. Channels 58 extend from adjacent second end 12 to adjacent first end 10, although the centre channel 64 ceases before flat area 44, and at accumulation area 24.

Each channel 58 is substantially U-shaped, having side walls 60, base 62, and an open top 66. Base 62 is, preferably, generally flat. However, other shapes may be used such as, for example, a V-shape. The channels 58 preferably taper slightly from ends 10, 12 towards accumulation area 24 to encourage oil to flow to accumulation area 24. The taper may be by curving the channels with a large radius such as, for example, 2000mm. As can be seen, in region 28 the channels 58 are of significantly increased vertical height compared to that at base 22. Channels 58 continue up first end 10 but reduce in height to flange 14.

It is also to be noted that at second end 12 the usual "bridge" used to attach the oil pan to the transmission casing has also been eliminated. Channels 58 increase powertrain bending resistance, rigidity and torsional stress resistance. With the channels 58 extending from adjacent first end 10

to adjacent second end 12, flat surfaces are reduced, thus reducing NVH effects.

The channels 58 create small, flat areas. This tends to reduce NVH. By channels 58 having differing vertical heights, the oil pan has increased resistance to the various flexing forces on it from different causes such as, for example, the crankshaft, transmission, and so forth.

Adjacent the accumulation area 24 the channels 58 are of reduced vertical height to assist in minimising oil volume shift during lateral acceleration at, for example, 1g. However, the channels 58 assist in oil flowing to accumulation area 24 due to the taper.

Furthermore, with the elimination of the use of a third die, the manufacturing operation can use a two die process. This reduces the cost and time taken for the making of tooling; simplifies machining requirements; lowers production costs, may reduce quality variation; and simplifies the machining of end surface 56.

Whilst there has been described in the foregoing description a preferred construction of an oil pan incorporating the principal features of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention.

The claims:

1. An oil pan for an engine, the oil pan having a plurality of substantially parallel, spaced-apart reinforcement channels extending from adjacent a first end of the oil pan to adjacent a second end of the oil pan, each channel having a base and two sides and an open top; the channels tapering downwardly from the first end and the second end towards an accumulation area of the oil pan.
2. An oil pan as claimed in claim 1, wherein the reinforcement channels are substantially U shaped.
3. An oil pan as claimed in claim 1, wherein the reinforcement channels are V-shaped.
4. An oil pan as claimed in any one of claims 1 to 3, wherein the second end of the oil pan has an end surface which is substantially planar.
5. An oil pan as claimed in claim 4, wherein said end surface has no tool access pockets therein.
6. An oil pan as claimed in any one of claims 1 to 5, wherein adjacent the second end and intermediate the width of the second end, the oil pan has a region of reduced height; the region of reduced height having a planar portion into which the at least one reinforcing channel does not extend.

7. An oil pan as claimed in claim 6, wherein the planar portion is adapted to releasably receive thereon a horizontal portion of a substantially L-shaped cover plate.
8. An oil pan as claimed in claim 7, wherein the cover plate has a substantially upright portion such that when the cover plate is mounted on the planar portion, the substantially upright portion is substantially coplanar with the end surface.
9. An oil pan as claimed in claim 8, wherein the substantially upright portion has a securing flange at an end thereof remote from the horizontal portion.
10. An oil pan as claimed in any one of claims 1 to 9, wherein the taper is created by curving the channels with a large radius of curvature.
11. An oil pan as claimed in any one of claims 1 to 10, wherein the radius of curvature is 2000mm.
12. An oil pan as claimed in any one of claims 6 to 11, wherein the oil pan has a main body, the main body having a base, two side walls, a first end wall, and a base; the accumulation area being integral with the base.
13. An oil pan as claimed in claim 12, where the main body has a second end wall which tapers into the region of reduced height.
14. An oil pan as claimed in any one of claims 11 to 13, wherein there are no channels in the accumulation area.

15. An oil pan as claimed in any one of claims 12 to 14, wherein the channels extend up the first end wall but at a reducing height up the first end wall.

8 16. An oil pan as claimed in any one of claims 12 to 15, wherein the channels along the base are of a height which is less than their height in the region of reduced height.

17. An oil pan as claimed in any one of claims 1 to 16, wherein there are three channels.

10 18. An oil pan as claimed in claim 7, wherein the cover plate has an upright portion, the upright portion having a securing flange at an end thereof remote from the horizontal portion.

19. An oil pan as claimed in claim 18, wherein the upright portion is substantially coplanar with the end surface.

15 20. An oil pan as claimed in claim 18 or claim 19, wherein a plurality of bolt holes are provided in each of the securing flange and the horizontal portion.

21. An oil pan as claimed in claim 20, wherein bolt holes are not provided in the upright portion.

Abstract**OIL PAN FOR AUTOMOBILE ENGINE**

8 An oil pan for an engine, the oil pan having a plurality of substantially parallel, spaced-apart reinforcement channels (58) extending from adjacent a first end (10) of the oil pan to adjacent a second end (12) of the oil pan, each channel (58) having a base (58) and two sides (60) and an open top (66); the channels (58) tapering downwardly from the first end (10) and the second end (12) towards an accumulation area (24) of the oil pan.

Figure 1

OIL PAN FOR AUTOMOBILE ENGINE

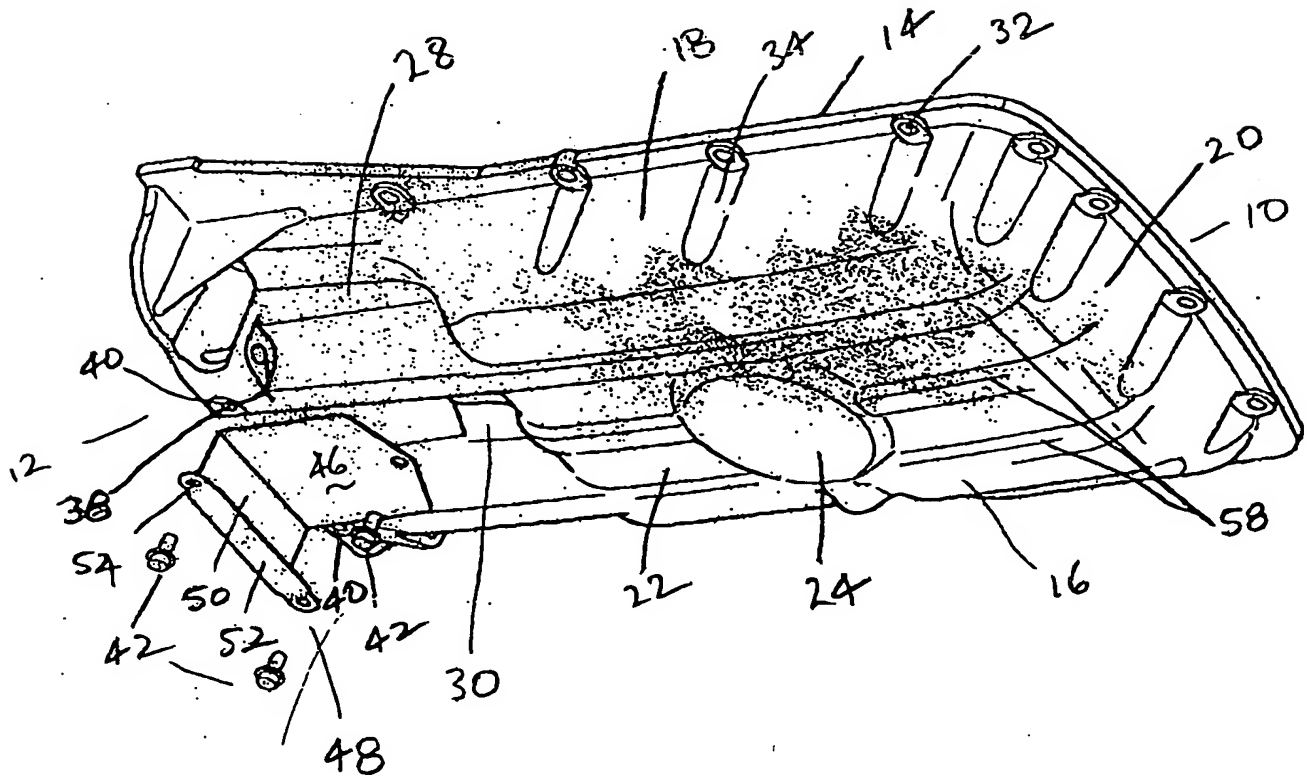


FIGURE 1

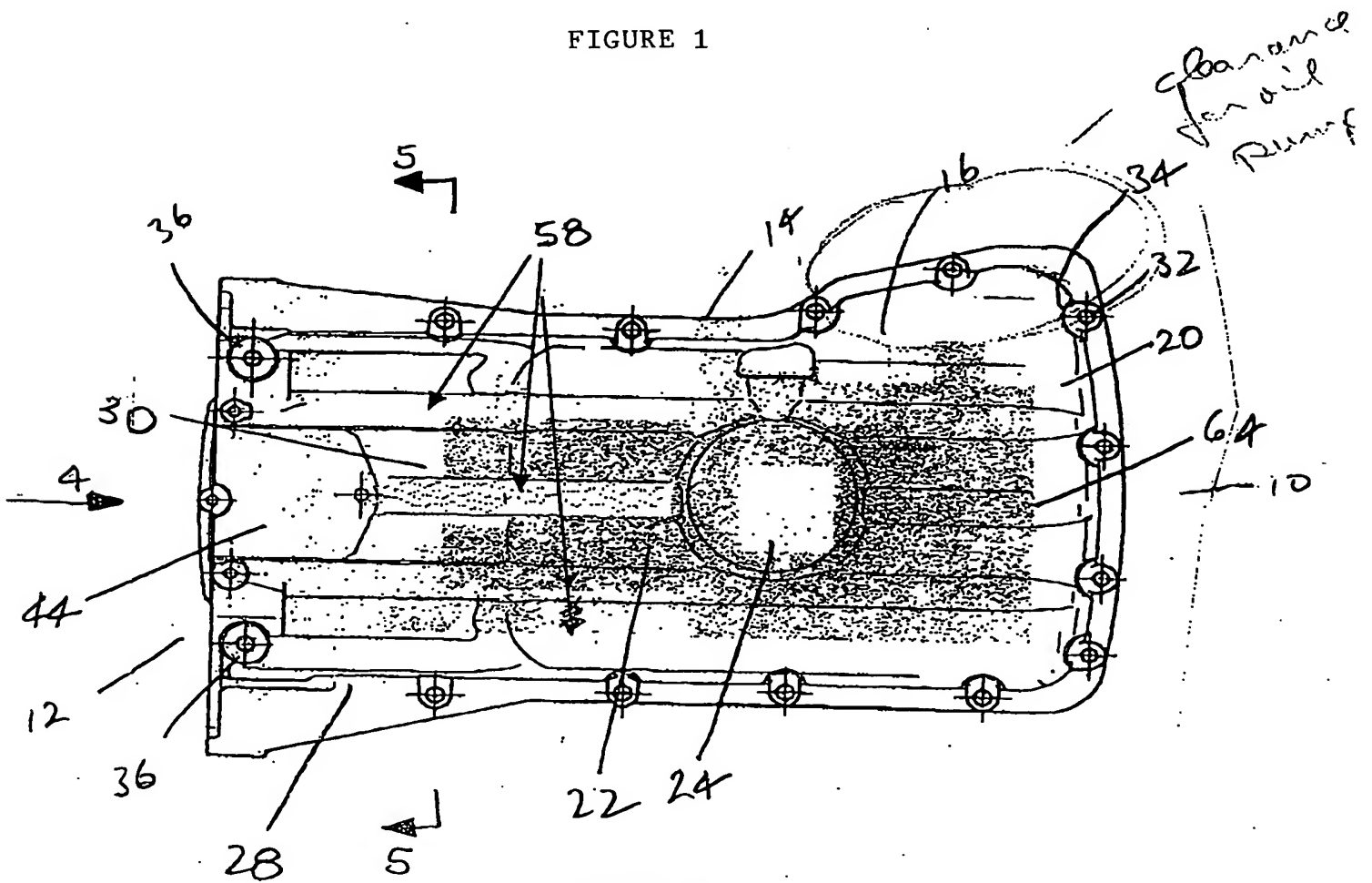


FIGURE 2

OIL PAN FOR AUTOMOBILE ENGINE

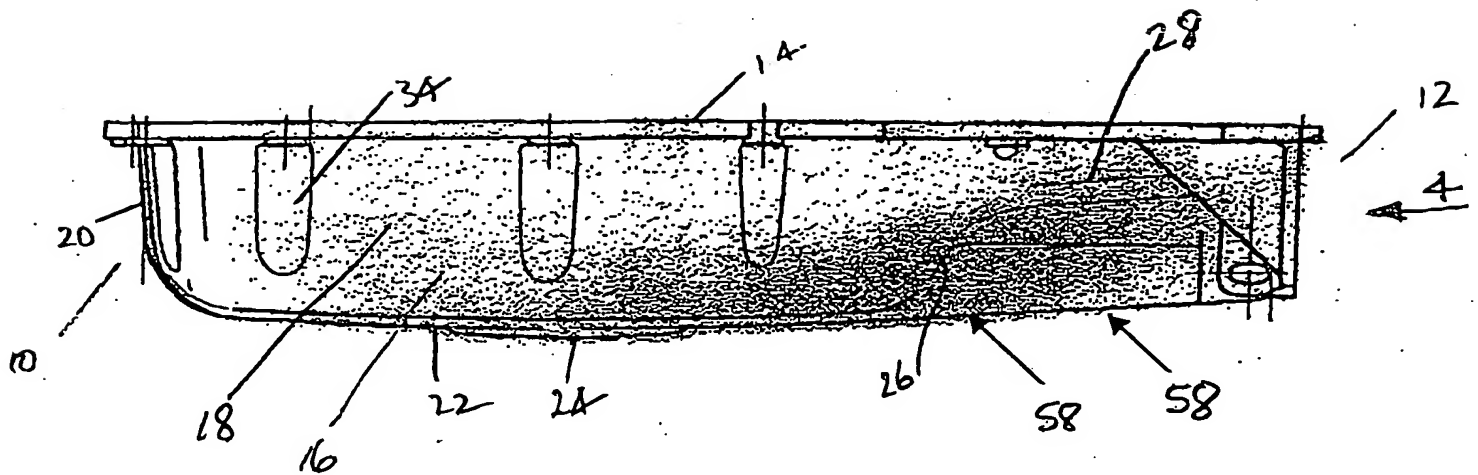


FIGURE 3

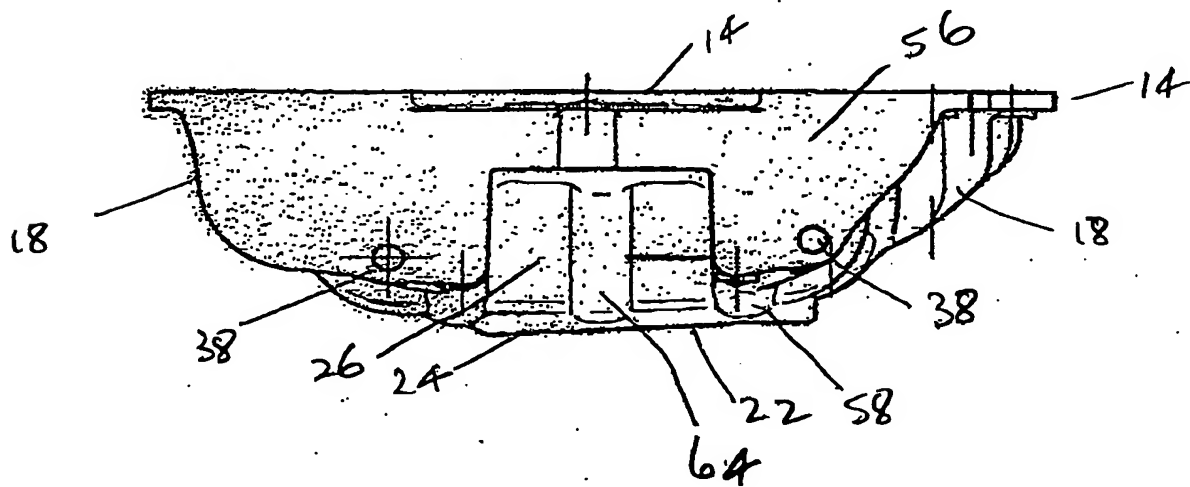


FIGURE 4

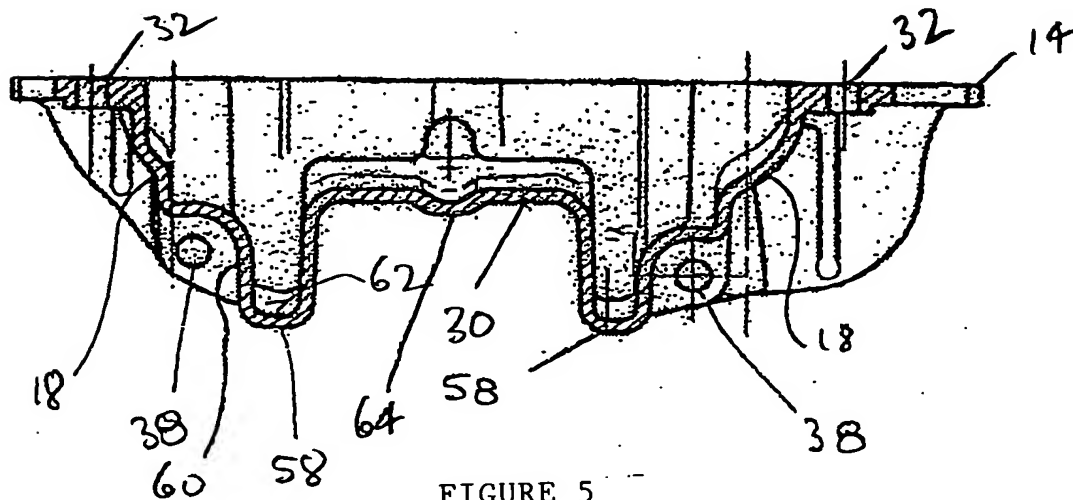


FIGURE 5